

## Appendix I



Bill Zimni/USFWS

*Boreal fen and bog habitat on the refuge*

# Fire Management Plan



# **FIRE MANAGEMENT PLAN**

## **LAKE UMBAGOG NATIONAL WILDLIFE REFUGE**

**COOS COUNTY, NEW HAMPSHIRE  
OXFORD COUNTY, MAINE**



**2006**

# FIRE MANAGEMENT PLAN

## Lake Umbagog National Wildlife Refuge

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## **I. Introduction**

The Fire Management Plan for the Lake Umbagog National Wildlife Refuge, hereinafter referred to as “the Refuge” or Lake Umbagog, has been developed to comply with U.S. Department of Interior and Fish & Wildlife Service policy requirements as explained in Section II below, and to support refuge management goals and objectives. Although a Comprehensive Conservation Plan is in draft, sufficient management direction is provided in the Legislated Purposes of Lake Umbagog to provide general guidance for fire management planning. The development of a Habitat Management Plan is also progressing which will provide specific habitat goals and objectives for the refuge.

This initial Fire Management Plan for the refuge addresses protection from wildfire through preparedness and suppression actions. Wildland fire is an unplanned event and as such, involves no decision for public input on environmental effects. This plan qualifies for a Categorical Exclusion under the National Environmental Policy Act (NEPA). The plan is not anticipated to individually or cumulatively have significant adverse impacts on the environment. Activities herein are included in the Service’s actions designated as NEPA categorical exclusions in 516 DM 6 Appendix 1, 1.4 B. (5) and would not be exceptions to categorical exclusions (516 DM 2, Appendix 2). This plan also meets requirements of the National Historic Preservation Act and the Endangered Species Act.

In the future, as the refuge staff develops a more complete understanding of the refuge and desired conditions, it may well be that prescribed burning will be identified as an appropriate tool to achieve some management objectives. In that case the Fire Management Plan (Plan) will be updated to include a prescribed burning section, and an Environmental Assessment involving public involvement will likely be warranted.

Currently the only known federal-listed threatened and endangered species known on the refuge is the American bald eagle. A Section 7 consultation for this Fire Management Plan will be coordinated with the New England Field Office of Ecological Services in conjunction with their review of the Comprehensive Conservation Plan and Environmental Impact Statement for the refuge NWR (draft CCP 2006). The refuge will initiate an emergency Section 7 consultation should other federally listed species be discovered during the course of fire suppression activities.

Anasagunticook Native Americans (Umbagog translates to “clear water”) had recognized the habitat and abundant wildlife found around Umbagog Lake as special and important. They hunted, trapped, and traded around the lake and its rivers. European settlers brought farming and logging to the area. Archaeological remains in the form of prehistoric camp sites or villages would most likely be located along streams and lakes and may be protected by the increased surface area of the lake due to the construction of the Errol dam. Consultation with the New Hampshire and Maine Historic Preservation Commission indicates that there are at least five occurrences of recorded historic and pre-historic sites on current refuge lands.

Staff will continue to consult with the Fish & Wildlife Service Regional Historic Preservation Office (RHPO) and State Historic Preservation Officer (SHPO) in identifying sensitive cultural resource sites, and ensuring that known or suspected sites are not disrupted.

Development of the Plan has been a collaborative process with Federal, State, and local partners. Refuge staff are particularly indebted to the New Hampshire Department of Resources and Economic Development, Division of Forest and Lands and the Maine State Forest Service, Division of Fire Control for their offer to review the draft. Partner involvement, which includes Errol, Lincoln Plantation, Magalloway Plantation, and Upton town fire departments, will continue to be critical to implementing successful wildfire prevention and suppression actions.

The authority for funding (normal fire year programming) and all emergency fire accounts is found in the following authorities:

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

PL. 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990, established the funding mechanism for normal year expenditures of funds for fire management purposes.

31 US Code 665(E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Fire Business Management Handbook (2004).

The Reciprocal Fire Protection Act of May 27, 1955 (42 USC 815a; 69Stat 66) provides authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals regarding fire activities.

Authority for interagency agreements is found in "Interagency Agreement for Fire Management between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture" (2002).

## **II. Relationship to Land Management Planning/Fire Policy**

### **A. Policy**

U.S. Fish and Wildlife Service fire policy is tiered to Department policy (620 DM 1 1998) and is contained in 621 FW 1 of the Fish and Wildlife Service Manual (February 2000). The Interagency Standards for Fire and Fire Aviation Operations Handbook (commonly known as the Redbook) supplements policy for all federal land agencies and notes agency specific exceptions. The Fire Management Handbook provides general operational guidance for fire management activities in

the U.S. Fish and Wildlife Service and further supplements policies, guidance, and standards. The following key points summarize the information contained in this guidance:

- Firefighter and public safety is the first priority of the Fire Management Program.
- Only trained and qualified people will conduct fire management duties.
- Trained and certified employees will participate in the wildland fire management program as the situation demands. Agency administrators are responsible and accountable, and will make employees available to participate in the program.
- Fire management activities will be conducted on an interagency basis with the involvement of all partners when appropriate.
- An approved Fire Management Plan must be in place for all of our lands with burnable vegetation.
- We will integrate fire as an ecological process into resource management plans and activities on a landscape scale, across bureau boundaries, based on the best available science.
- We will use wildland fire to meet identified resource management objectives when appropriate and the Fire Management Plan contains such direction.
- We will employ prescribed fire whenever it is an appropriate tool for managing our resources, and will protect against unwanted wildland fire whenever it threatens human life, property, and natural or cultural resources. Once we commit people to an incident, these human resources become the highest value we protect. If we must prioritize between property and natural or cultural resources, we will base the decision on relative protection values, commensurate with fire management costs.
- Regions will provide safe, cost-effective fire management programs in support of land, natural, and cultural resource management plans through appropriate planning, staffing, training, and equipment.
- Management actions we take on wildland fires will consider firefighter and public safety, be cost effective, consider benefits and protection values, and be consistent with natural and cultural resource objectives.

## **B. Enabling Legislation**

Lake Umbagog, the 480<sup>th</sup> addition to the Refuge System on November 17, 1992, was established with the following purposes under the following National Wildlife Refuge Acts:

...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions... 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)

...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds... 16 U.S.C. § 715d (Migratory Bird Conservation Act)

...for the development, advancement, management, conservation, and protection of fish and wildlife resources... 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)

...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude... 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

Protection from unwanted wildland fires will serve to further the purposes of conserving fish populations which may be affected detrimentally by erosion and water quality problems resulting from wildfires; protect wildlife habitat which could be substantially altered by severe wildfire; protect sensitive biological communities which may not be adapted to the presence of fire; and forestall possible negative effects of wildfire on research study sites, educational sites, and recreational access. It is also recognized that in some limited cases fire may be beneficial to certain biological communities which are adapted to fire, or to some wildlife species which could benefit from habitat conditions resulting from fire. However, no prescribed fires will be used until a future determination is made, based on additional scientific information, that prescribed fire is a beneficial management tool and its use is stipulated in an updated Fire Management Plan.

### **C. Significant Resources and Values**

The refuge ownership currently includes 20,503 acres of forest, wetlands, riparian, and open water habitats comprising the protection of Umbagog Lake. Of those acres, all but six are owned in fee-simple by the Service. Located in northern New Hampshire along the Maine state line, the refuge is part of a comprehensive cooperative protection and management effort with the states of New Hampshire and Maine and many private industries. New Hampshire has acquired more than 1,000 acres and Maine conserves an additional 1,600 acres. This combination of ownerships and easements protects nearly all of the Umbagog Lake shoreline in New Hampshire and Maine, and significant lengths of shorelines along the Androscoggin and Magalloway Rivers. The refuge lies north of Route 26 and east of Route 16, near Errol, New Hampshire. A map depicting current refuge boundaries is found in attachment A (Locality Map).

The refuge lies within a glacially scoured granitic basin at an elevation of roughly 1,240 to 2,300 feet above sea level. Principal hydrologic features on the refuge proper are Umbagog Lake (10 miles in length, 8,500 acres of surface area, with an average depth of 15 feet) and Cambridge or C Pond. Rapid River, Magalloway River, Swift and Dead Diamond rivers, and Swift and Dead Cambridge rivers, all feed into the lake. The lake's dammed outlet forms the start of the Androscoggin River which flows south and east to the Gulf of Maine. Lake Umbagog's original surface area was expanded nearly five-fold with the construction of the original Errol Dam in 1853 and its subsequent replacement in the 1880s. The additional water storage was used for log drives in the late 1800's and early 1900's.

About 47% percent of the refuge lands are wetlands. These wetlands are the most extensive and diverse in the Upper Androscoggin watershed and include several types of communities including floodplain forest, northern white cedar swamp/forest, black spruce bog, boreal fens and bogs, emergent marsh, scrub-shrub, and wet meadow. Floating Islands Bog was recognized as a unique natural community and in 1971 the Secretary of the Interior granted the community a National Natural Landmark designation.

The refuge is situated at the southern range of the boreal forests and the northern range of the deciduous forests, making up a very diverse mix of vegetation and wildlife. Upland forests on the refuge include spruce fir, white pine, and northern hardwood. Much of the uplands, in industrial forest ownership prior to acquisition by the refuge, were subject to a century and a half of timber harvest. Mature spruce-fir forest is scarce, and the ratio of spruce to fir is far lower than was historically present (Publicover and Weihrauch 2003). White pine remains a component of the forest, but the abundant shoreline stands have been reduced to scattered groups and individual trees.

The refuge includes a small percentage of agricultural land. The Potter Farm at the southern end of the lake and holdings along the Magalloway River include both open and reverting fields. (see Attachment A; Map I-2: Generalized Habitat Map).

Human infrastructure consists of a network of roads, skid trails, and landings throughout the Division that was originally constructed for logging purposes.

#### **D. Other Management Plans**

Due to its recent establishment, a Comprehensive Conservation Plan (CCP) is in draft, with expected completion in 2006. An Environmental Assessment addressing Public Hunting was prepared in January 2000. Currently Lake Umbagog Refuge is working under the broad guidance of the 1991 Final Environmental Impact Statement (U.S. Fish and Wildlife Service 1991) and other Regional and National policies. Although no resource specific step-down plans have been produced, the refuge is working with Regional biological staff to assemble information for a Habitat Management Plan (2005 completion). The Fire Management Plan will complement and support the goals and objectives of the Habitat Management Plan in the sense that ensuring public (and firefighter) safety is the first priority of any fire management activity, and fire suppression strategies and tactics will incorporate resource concerns. Any decisions will be made by the Refuge Manager in consultation with the State Fire Protection agencies, local fire chiefs, and incident commanders.

#### **E. Refuge Goals and Objectives**

The Comprehensive Conservation Plan (CCP) is scheduled for public release in 2006. In the interim, the refuge has worked under the 1991 Enabling Purposes of the Lake Umbagog National Wildlife Refuge (see section II.B.). At this time these purposes provide the basis for developing fire management goals and objectives. Additional or more refined goals and objectives may result from the Habitat Management Plan process which is currently underway as of this writing.

### **III. Wildland Fire Management Strategies**

#### **A. General Management Considerations**

The 10-Year Comprehensive Strategy of the National Fire Plan identifies the three core principles of collaboration, priority setting, and accountability. This Plan addresses these principles in the following manner:

**Collaboration – Facilitate a collaborative approach at the local, regional, and national levels.**

The refuge recognizes that the key to successful fire control lies with the local fire departments under the direction of the Town Fire Chiefs and Forest Fire Wardens. The fire departments and state appointed wardens provide the closest forces capable of responding safely to a wildland fire incident, since the refuge itself does not maintain an initial attack suppression force. The refuge and the Region will continue to support and foster these local relationships by encouraging collaborative meetings for training and information sharing, and requesting their input into the fire management decision-making process.

Another opportunity for fostering collaborative relationships is to provide Rural Fire Assistance (RFA) grant funds to cooperating fire departments, such as the grants provided to the Magalloway Plantation and Wilsons Mills (Lincoln Plantation) fire departments in 2004. Magalloway Plantation received a second grant in 2005. The Department of Interior RFA program provides up to \$20,000 to rural fire departments which provide initial attack support to Interior lands, at a 90% cost share, for the purposes of purchasing wildland personal protective equipment, and providing wildland fire training. In 2004 Magalloway Plantation and Wilsons Mills received \$3,600 and \$10,620 from this program, respectively.

After the local fire departments and Town Fire Wardens, the second tier of fire suppression support lies with the New Hampshire Department of Resources and Economic Development, Division of Forests and Lands (NHS) and Maine Forest Service (MES). NHS and MES resources include qualified personnel with experience in wildland firefighting, and caches of firefighting equipment, such as portable pumps and forestry hose. These could be put to good use if a fire transitioned to an extended attack situation, or if the Initial Attack Incident Commander determined that the nature of fuels and fire behavior was such that additional support was needed.

The third tier of support would lie with the closest federal wildland fire suppression resources, namely the White Mountain and Green Mountain National Forests of the U.S. Department of Agriculture (U.S.D.A.), Forest Service. These Forests have qualified personnel with experience in forest fire suppression, and maintain caches of suppression equipment on each District. Although too distant to be an asset for initial attack, the Forests could provide help in an extended attack (Type 3) situation. Also available for extended attack would be other refuges in New England with fire suppression resources, specifically Nulhegan Basin Division of the Silvio O. Conte Fish and Wildlife Refuge in Vermont, and the Maine refuges including Rachel Carson in Wells, Sunhaze Meadows in Old Town, and Moosehorn in Calais.

**Priority Setting – Emphasize the protection of communities, municipal, and other high-priority watersheds at risk.** Emphasis of the suppression and preparedness program will be protection of human life and property, specifically abutting residences and businesses. Maintenance of access roads for emergency equipment will be the primary focus of future preparedness efforts and hazard reduction fuels treatments. A second priority will be protection of hydrologic features from the effects of severe wildfires.

**Accountability – Establish uniform and cost-effective measures, standards, reporting processes, and budget information in implementation plans that will fold into the Government Performance and Results Act (GPRA) process.** The primary performance measure for the refuge is to control 95 % of all wildfires during the initial attack phase.

## B. Wildland Fire Management Goals

The goals of the fire management program support the refuge purposes, and also support the principles outlined in the U.S.D.A./D.O.I. National Fire Plan, 10 Year Comprehensive Strategy, and Cohesive Strategy:

- Make firefighter and public safety the highest priority of every fire management activity.
- Suppress all wildland fires in a safe, efficient, and cost-effective manner.
- Educate employees and the public about the scope and effect of wildland fire management, including fuels management, resource protection, prevention, hazard/risk assessment, mitigation, rehabilitation, and fire's role in ecosystem management.
- Utilize Minimum Impact Suppression Tactics (MIST) whenever feasible, commensurate with firefighter safety and resources to be protected.
- Protect abutting residences, businesses, camps, sensitive biological communities, and hydrologic features from the effects of wildfire.
- Ensure access roads, critical for fire suppression, are maintained to a standard suitable for local fire department equipment.
- Minimize opportunities for invasive species introductions when utilizing heavy equipment on wildfires, or when assessing rehabilitation and restoration needs following wildfire occurrence.
- Identify fire management research needs, work with partners to develop proposals and obtain funding, and apply research results to fire planning through the adaptive management process.
- Collaborate with local, state, and federal partners when planning and implementing wildland fire preparedness, prevention, and suppression actions.
- Support local fire department cooperators through the Rural Fire Assistance grant program.

## C. Wildland Fire Management Options

Normally a fully-evolved fire management program on Department of Interior lands includes a variety of options for dealing with wildland fire which may include:

- Suppression of unwanted wildland fire (wildfire)
- Less aggressive suppression or monitoring only of some wildland fires to allow fire to assume its natural role in a fire-adapted ecosystem or to achieve resource benefits (wildland fire use)
- Intentionally igniting fire under carefully controlled conditions and according to an approved plan, to achieve a management objective (prescribed fire)
- Reduction of fuel accumulations around structures or other values at risk by mechanical, chemical, or fire means (hazard fuels reduction)

The fire management program at Lake Umbagog will be limited to wildfire suppression only, until some future time when it may be determined that prescribed fire is desirable to achieve certain

management objectives. Limited hazard fuels reduction by mechanical means may be conducted along roads to provide fuel breaks as well as improved vehicular access for suppression.

Wildland fire use is not considered an appropriate fire management option at Lake Umbagog NWR for several reasons:

- Northern hardwoods types are generally not considered fire-adapted ecosystems.
- Protection of values at risk such as residences, businesses, and sensitive biological communities are of the highest priority. An aggressive and immediate suppression response is needed to protect these values.
- The refuge's upland is nearly 100 percent forested, with moderate to heavy fuel accumulations in most cases and deep organic soils in some lowland areas. Under drought or high fire danger conditions, anything less than a rapid and aggressive response could result in protracted, expensive suppression efforts later with severe, adverse fire effects to the landscape.

Associated with the need to take effective wildfire suppression action are efforts which should be undertaken prior to or during the fire season such as preparedness, prevention, and operational planning meetings with cooperators. These will be discussed in some detail later in this Plan.

## **D. Wildland Fire Management Strategies by Fire Management Unit**

### **1. Historic Role of Fire**

Forests of northern New England differ from the pitch pine and oak-hickory forests of southern New England, and indeed most other forest types in the United States, in the sense that natural fire is not considered a major ecological driver. Fires burned the northern hardwood forests, but only rarely. Bonnicksen (2000) estimates that light surface fires crept through the forest about once in 600 years, and severe fires only burned it once in 3,000 years. Even light surface fires can kill beech and maple trees. In the spruce-fir forests, the average area in northern New England burned on a 200-400 year cycle, and some areas escaped a major fire for as long as 800 years (Bonnicksen 2000). Cogbill (2001) estimates that the pre-settlement fire return intervals for forests in this region were on the order of "several millennia" based on witness tree reports from colonial land surveys. In an earlier paper, Cogbill (2000), examined reports of witness trees from pre-settlement land surveys involving 179 towns in northern New England and New York and determined that overall roughly 0.5% of the region was affected by major disturbances at the time of settlement. Despite the apparent rarity of catastrophic disturbances in the region, medium- and small-scale perturbations caused widespread, but patchy mortality. This pattern of site-level mortality is due to the relatively short growing season, nutrient poor soils, heavy snow and ice loads, frequent stem breakage, and wind throw due to moderate winds associated with thunderstorms or frontal passages. Disturbance at this level resulted in a varied landscape dominated by a diverse, small-scale mosaic (Cogbill 2001). Interestingly, Cogbill found no mention of insect (spruce budworm) damage in the colonial land surveys and determined that the past effects of this insect were much more limited than at present. Cogbill also admits that there is some uncertainty about the pre-

settlement role of fire in shaping the lowland conifer forests; the “black spruce swamps” have environmental and floristic similarities to northern systems in Maine and Canada which burn regularly. Perhaps the lack of fire in the pre-settlement record represents inauspicious timing or is in error.

There is indication that Native Americans used the area for permanent village sites, but the region was mainly used as hunting and fishing grounds. During the period of European Contact (1600-1750) Native American groups frequently traveled through the area, between the St. Lawrence and St. Francis Rivers in Canada and the Androscoggin drainage in Maine, for trading purposes or to conduct warfare. It seems likely that some fires were started to aid hunting or escaped from abandoned cooking fires.

The period from about 1780 to 1850 saw Euro-American settlement and the initiation of agriculture in the area. Logging and dairy farms were the principal agricultural endeavors. By 1870 the railroad system in New Hampshire and Maine was essentially complete (Wallace 1989). Accidental and intentional ignitions undoubtedly followed as people settled the area.

## **2. Fire Characteristics and the Fire Environment**

### **a. Weather and Climate Patterns**

The climate of the Upper Androscoggin Watershed is temperate continental, with warm summers, cold winters, and a relatively even monthly distribution of precipitation throughout the year. Annual precipitation averages 39 inches, and snowfall averages over 100 inches. The region has four distinct seasons. Winter temperatures, December through February, average only 14° F, with minimum temperatures as low as – 34°F. Summer months, June through August, average 62° F, reaching highs of 96°F or more. (Lake Umbagog Draft CCP).

### **b. Fire Season**

The small number of wildland fires occurring in northern New Hampshire and western Maine makes determination of a “typical” fire season difficult, since the historic database which could be analyzed is limited. Many wildland fires occur after snowmelt in the spring, but prior to tree green-up in a fairly narrow window between April and early June. A fall fire season may occur in October and early November after leaf fall and prior to early snows. Summer fires are very rare but may occasionally occur during droughts.

## **3. Fuel Types and Potential Fire Behavior**

The natural vegetation communities found at the refuge offer some insight for selecting National Fire Danger Rating System (NFDRS) fuel models used for fire danger purposes, and corresponding Northern Forest Fire Laboratory (NFFL) fuel models used to estimate potential fire behavior on a more localized scale. Particularly for the NFFL fuel models, this discussion is intended only to give a very generalized idea of the type of fire behavior which can be expected; the actual fuel model

appropriate for a given acre of ground requires firsthand observation of the conditions present on the scene. The acres listed in each fuel model discussion below represent current, Service-owned lands within the refuge boundary. Since boreal fen is mostly herbaceous, it is lumped in with “Residential Fields/Grasslands.” The Floating Islands Bog National Natural Landmark (bog) is unlikely to burn; but in dry years, most likely would fit the “Scrub-Shrub” surface habitat type. Open water (5,033 acres) is non-burnable habitat. Table I.1 below summarizes the habitat types on the refuge, their potential to burn, and their associated NFDRS and NFFL models.

**Table I.1. Summary of Lake Umbagog NWR habitat types, acres, and associated fuel models.**

Habitat Type	Acres	NFDRS Fuel Model	NFFL Fuel Model
Lowland/Upland Spruce-fir	1,947	G	10
Northern White Cedar Swamp	829	G	10
Mixed Woods	3,478	E	9
Northern Hardwoods	4,488	E/R	9
Fen and Flooded Meadow	482	R	9
Scrub-Shrub	655	R	9
Recently Harvested	938	R	9
Lakeshore Pine-Hemlock	232	H	8
Wooded Floodplain	1,140	R	8
Residential Fields/Grasslands	107	L	1
Total Burnable Acreage	14,296		
No Burn habitat (boreal fen/bog/water)	6,217	NA	NA
<b>Total</b>	<b>20,513</b>		

**a) Fuel Models E/R, NFFL Fuel Model 9 (9,559 acres)**

These fuel models apply to the following habitat types on the refuge:

- 1) Northern Hardwoods
- 2) Mixed Woods
- 3) Recently harvested
- 4) Scrub-shrub wetlands

Fuel model E describes typical eastern deciduous forest conditions which exist during the dormant season, or periods when no live foliage is present on the trees. This corresponds to the normal spring fire season prior to green-up and the fall season immediately following leaf fall. Fuel model R describes the same eastern deciduous forests during those times of year when live foliage is present; since fire occurrence is rare during this time of year, this discussion will focus on fuel model E.

**Description:** These fuel models were based on open or closed hardwood stands and mixed stands with leaves off. Litter layer is fluffy, leaves subject to movement under windy conditions. Scattered concentrations of dead-down woody materials are greater than in Fuel Model 8 and in the case of the refuge may be exacerbated by recent logging operations. While this fuel model was based on fire danger, and how fire would behave, in a deciduous or mixed forest type, our Fire Management Officer has determined that, in addition to our northern hardwoods and mixed woods habitat types, fire would behave similarly on the refuge's recently harvested and scrub-shrub types.

**Fire Behavior:** Fires in this fuel type will have a higher rate of spread due to the deciduous leaf litter layer. Under windy conditions expect spotting problems from rolling and blowing leaves. Fires will generally remain on the surface and can be a problem in the spring before green-up. This fuel type can also be a problem in the fall if normal moisture is not received and an unwanted ignition source is present, especially in bog habitat, where organic soils are present. Flame lengths can exceed 2 feet with a rate of spread of 5 to 10 chains/hour that possibly causes containment problems under windy conditions.

**b) Fuel Model H, NFFL Fuel Model 8 (1,372 acres)**

These fuel models apply to the following habitat types on the refuge:

- 1) Lakeshore Pine-Hemlock
- 2) Wooded Floodplain

**Description:** Closed to semi-closed canopy stands of conifers, in association with lakeshore habitat. Litter layer is compact, composed of needles and twigs. Little undergrowth is present. Light Insect/disease damage and windthrow add to an otherwise light fuel loading but is rarely uniform over the landscape. A heavier fuel amount from natural causes when present is better modeled as Spruce-fir, discussed below.

**Fire Behavior:** Slow-burning surface fires are generally the case. Fires will normally exhibit low rates of spread (under three chains/hour) with flame lengths less than 2 feet except when an occasional fuel concentration is encountered. Fires normally will remain on the surface, except under dry conditions where fire may burn down through the duff layer and into underlying organic deposits. It is only under severe weather conditions involving high temperatures, low relative humidity, and high winds, do these fuels pose fire hazards. Occasional flare-ups and small patches of group tree torching are possible when fire encounters heavier fuel concentrations. While this fuel model was based on fire danger, and how fire would behave, in a semi-closed conifer forest type, our Fire Management Officer has determined that, in addition to our lakeshore pine-hemlock forest type, fire would behave similarly in the refuge's wood floodplain habitat type.

**c) Model G, NFFL Fuel Model 10 (2,776 acres)**

These fuel models apply to the following habitat types on the refuge:

- 1) Spruce-fir
- 2) Northern White Cedar Swamp

**Description:** Dense conifer stands with a heavy accumulation of litter and down woody material. Such stands typically suffer from insect, disease, and wind or ice damage. Duff and litter layers are deep and much of the woody material is more than three inches in diameter. Undergrowth is variable, but shrubs are usually restricted to canopy openings. This model represents aged stands of northern white cedar swamp, and all upland spruce-fir and associates where 75% of canopy is conifer.

**Fire Behavior:** Fires burn in the surface and ground fuels with greater intensity than other timber litter models. Dead-down fuels include greater quantities of three-inch or larger limb wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation leading to potential fire control difficulties. Under high fire danger conditions, fires will typically spread at 5-10 chains/hour and flame lengths will average 3-4 feet. Higher flame lengths result when crowning or torching trees are involved.

**d) Model L, NFFL Fuel Model 1 (589 acres)**

These fuel models apply to the following habitat types on the refuge:

- 1) Fen and Flooded Meadow
- 2) Residential Fields

**Description:** This model represents the grassland fields associated with former residences. Fine perennial grass species predominate with some annual grasses and other herbaceous fuels present. Fuel loading is generally under two tons/acre. The upland fields are periodically mowed, thus fuel bed depth is less than two feet for much of the year. A small amount of encroaching woody vegetation, typically occupying less than 25% of the site, is present in most situations. While this fuel model was based on fire danger, and how fire would behave, in the grassland type, our Fire Management Officer has determined that, in addition to our residential fields type, fire would behave similarly in the refuge's fen and flooded meadow habitat type.

**Fire Behavior:** Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Fires occurring within this fuel type are typically a problem in the spring and occasionally in late fall when perennial grasses are cured. High spread rates can be expected, but fire intensities remain low

and are short in duration. Flame lengths may approach four feet with a rate of spread in excess of 50 chains/hour with an associated wind event. A fire in this fuel type usually will do little lasting resource damage.

### **3. Fire Management Units**

A Fire Management Unit (FMU) can be defined as “any land management area definable by objectives, management constraints, topographic features, access, values to be protected, political boundaries, fuel types, major fire regime groups, and so on, that set it apart from the management characteristics of an adjacent FMU.” In the case of the refuge, the FMU concept is less applicable due to the fact that the refuge is one contiguous tract of land rather than divided into various geographic units, and a strategy of aggressive fire suppression will be applied throughout. However, if one considers values to be protected, and the policy of fire fighter and public safety as top priority, refuge lands in the vicinity of abutting landowners, businesses and camps would receive priority in suppression response. These higher values are delineated as “Structure FMU.” Initial attack could be more aggressive in these areas than in some other parts of the refuge, although in reality suppression will commence as soon as practical in all areas of the refuge.

#### **a. Structure FMU**

The Structure FMU, though discontinuous, consists of all lands within a 0.25 mile radius of all homes, camps, other structures and improvements. Fire suppression will be most aggressive in these areas in order to protect these values. Should there be multiple fire starts in the Structure FMU and the Wildland FMU, resources will be directed to initial attack fires in the Structure FMU as highest priority.

#### **b. Wildland FMU**

This FMU consists of all vegetated lands on the refuge with the exception of a 0.25 mile radius around developments described above (Structure FMU). All fires within the Wildland FMU will be actively suppressed, though the tactics to be employed will vary depending on the criteria outlined in 4.b. Initial attack response capabilities may be limited or delayed if they are committment to the Structure FMU, but there will be an appropriate suppression response. Within this FMU, a larger fire may result in an effort to adequately protect higher values within the Structure FMU.

### **4. Fire Management Objectives**

#### **a. Structure FMU**

- Aggressive suppression action to be taken on all fires commensurate with firefighter and public safety.
- Maximum response time of one hour from the time fire is reported.

- Refuge Manager will work in conjunction with fire departments and local law enforcement officials to notify property owners and refuge visitors in the event of a fire emergency.
- Protecting high value resources is the highest priority, while containing a fire at one acre or less is not as important.
- Service personnel, by policy, will not enter buildings for the purpose of taking suppression action. Structural suppression will be handled only by local fire departments.
- Chemical retardant and foam will be used only to the extent necessary to protect structures. Every effort will be made to prevent water contamination.

#### **b. Wildland FMU**

- Suppression actions taken on all fires are commensurate with firefighter and public safety.
- Maximum response time of two hours from time fire is reported.
- Refuge Manager will work in conjunction with fire departments and local law enforcement officials to notify all members of the public in the vicinity of the fire area.
- Strive to contain all fires at one acres or less with no human injury.
- The Incident Commander, working in collaboration with the Refuge Manager or Resource Advisor, will determine the appropriate level of suppression and tactics to be employed based on considerations of human safety, actual and potential fire behavior, values to be protected, access, and expected suppression costs.
- Special consideration will be given to protecting sensitive biological communities from fire effects.
- MIST tactics will be employed to the maximum extent possible, given the considerations of safety, fire behavior, values, access, and cost.
- Use of dozers, skidders, and other heavy equipment will be undertaken only with the consent of the Refuge Manager.
- Avoid use of chemical retardant and foam.

### **5. Management Considerations Affecting Operational Implementation**

#### **a. Safety**

Firefighter and public safety is always of the highest priority when determining suppression strategy and tactics. No natural resource or property value is worth exposing humans to high risk situations. A more detailed description of safety considerations is contained in IV.A.2.

#### **b. Values at Risk**

Once human safety is assured, the values to be protected play into the decision of the strategy and tactics to be employed. For example, the areas near Umbagog Lake and other water courses may

receive a more direct and aggressive suppression response to protect these key lacustrine habitats than other areas with less sensitive values.

### **c. Current and Potential Fire Weather and Fire Behavior**

The Incident Commander must keep apprised of current and forecasted weather conditions on a continuous basis, and request, as needed, spot forecasts for the incident area. Increasing temperatures, falling humidity, and strengthening winds are always cause for concern and help dictate whether the fire will be attacked directly or in a more indirect manner such as falling back to a road or water barrier. Flank attacks must consider the likelihood of wind shifts and how such shifts could impact personnel on the line. NFDRS indices, particularly the energy release component, are good indicators of fire behavior potential and when considered along with fuel moisture indicators can give a good idea of the potential for high fireline intensities which may preclude direct attack or handline construction. The Keetch-Byram Drought Index is used in the Northeast to monitor long-term drought conditions and can give a good idea of the potential for severe, deep-burning fires which can consume organic soils and require prolonged mop-up.

### **d. Access**

Vehicular road access is a primary factor in determining response time and the type of equipment which can be dispatched to an incident. Bridges must be rated for the combined weights of equipment plus transport trailers. The condition of old logging roads must be evaluated for safe access. At the scene of the fire, ground conditions such as downed logs and deep organic soils can determine whether hand line must be constructed or if heavy equipment can be used, and if the equipment must be rated for low ground pressure conditions.

### **e. Barriers**

Barriers to fire spread such as roads, streams, rivers and other wetland habitats can be used effectively to hasten construction of control lines and minimize impacts. Barriers can also be used effectively for indirect attack, as a safe location to make a stand or as a secure place to burn out by removing fuels in front of an advancing fire.

### **f. Cost**

The Incident Commander should weigh the relative costs of various suppression strategies in comparison to values at risk, being sure not to compromise safety concerns. Too many suppression resources on an incident can cause confusion, congest access roads, and elevate the cost of suppression unnecessarily. Aircraft can be an effective resource under some circumstances, but may also be unnecessary or ineffective in many situations and can greatly escalate the cost of suppression.

## **IV. Wildland Fire Management Program Components**

A full range of fire management program elements should be reviewed and considered when developing a new program at a field station. These include wildfire suppression (and with it the associated elements of preparedness, training, prevention, and detection), wildland fire use, prescribed fire, non-fire fuel applications, and emergency rehabilitation and restoration.

### **A. Wildland Fire Suppression**

#### **1. Preparedness**

In 2003 an automated weather station was installed at the nearby Nulhegan Basin Division headquarters of the Silvio O. Conte National Fish and Wildlife Refuge on Route 105, Brunswick County, Vermont. This station, located approximately 30 miles due west of Lake Umbagog NWR, can be accessed by Nulhegan Basin Division staff, Vermont Department of Forest, Parks, and Recreation (VDFPR), or the Zone Fire Management Officer (FMO) for up-to-date weather. Data from this weather station are pertinent to Lake Umbagog because of its close proximity and similar topography, fuel types and weather patterns. Throughout the fire season, the Zone FMO will monitor the potential for critical fire activity on the Nulhegan Basin Division, based on drought severity (KBDI), 1000 hour fuel moisture, and associated weather trends that may contribute to limits of acceptable control. Fire Danger warnings and watches issued for Nulhegan will most likely apply to Lake Umbagog.

##### **a. Prevention**

The New Hampshire Division of Forest and Lands and the Maine Forest Service have an active public awareness program addressing human caused ignitions. Like all landowners, the refuge benefits from this, especially during the spring. Camping and campfires are allowed on the refuge at designated remote campsites. These campsites are managed through a cooperative agreement with the New Hampshire State Parks which holds a fire permit for these sites. During periods of extreme or prolonged drought and associated high fire danger, the Zone FMO will consult with the Refuge Manager and the state(s) for implementing area closures or other emergency restrictions regarding refuge operations to reduce potential ignition sources.

##### **b. Education**

Educating the public on the value of fire as a natural process, and the need to prevent unwanted wildfires, is important to increasing public understanding and support for the fire program. The refuge will use the most appropriate and effective means to explain the overall program. When necessary, interpretive presentations will address fire and explain its role in the environment. A program of internal and external education regarding potential fire danger will be implemented. Visitor contacts, bulletin board materials, handouts and interpretive programs can all be utilized to increase visitor and neighbor awareness of fire hazards. "Smokey Bear" and other fire prevention and education materials may be obtained with the assistance of the Regional Fire Management office. Consulting with the Zone FMO is the most effective method to determine the scope and best approach to enhance fire awareness.

### **c. Community Grant Assistance**

The Department's Rural Fire Assistance Program (RFA) has proven a great tool for training and equipping local fire departments in the vicinity of Federal lands. To date, the Magalloway Plantation (\$3,600) and Wilsons Mills (\$10,620) fire departments have received grant money for suppression equipment. These departments are the primary suppression force which the refuge depends on. Both departments, and possibly other fire departments in the area, have a continuing need for assistance to purchase wildland fire equipment and training and should be considered for future RFA grant assistance should it become available (it should be noted that the future of the RFA program beyond 2005 is uncertain at the time of this writing).

### **d. Training and Qualifications**

The refuge will conform strictly to Service-specific guidelines as well as the January 2006, National Wildfire Coordinating Group (NWCG) Publication 310-1, "Wildland Fire Qualification System Guide". Service employees participating in any wildland fire activities on U.S. Fish and Wildlife Service lands must meet these requirements as well as those for fitness and personal protective equipment (PPE). More information about training, fitness and PPE is provided in the FWS Fire Management Handbook, and through the New England Fire Management Officer (FMO) at Sunhaze Meadows NWR. The FMO will be consulted on arranging fire training for refuge staff.

The refuge relies on local fire departments for initial attack response, and all department members may not meet NWCG standards. This will not be a limiting factor for the first burning period of initial attack, as Federal agencies have agreed to honor the qualification standards of assisting entities during this initial phase. Should the fire extend into additional burning periods, then by policy, all suppression personnel will need to meet NWCG standards.

Red Card qualification information, such as training records, fire assignments, and physical fitness test results, are maintained through the Incident Qualifications and Certification System (IQCS). Refuge staff submits information annually, which is verified by the Zone FMO and entered into the IQCS computerized data base. The FMO maintains a file on refuge personnel; the refuge should document the training and experience an individual receives in his or her personnel file. A copy of the course completion certificates should also be placed in the individual's file.

### **e. Readiness**

Readiness activities include developing this plan and annually reviewing thereafter. First response for initial attack is made by local fire departments. Refuge staff should meet with local fire department personnel annually to review operating plans and procedures. Those Staff members with fire qualifications must complete annual refresher training and meet arduous fitness testing (e.g. pack test) prior to any initial attack action.

Cell phone service at the refuge is spotty and can not be relied on for emergency communications purposes. Local fire department and state radio communications will be the best options during a

suppression incident. A repeater-based narrowband radio project for the refuge was completed in 2004. The refuge operates 7 portable and 7 mobile radios at frequency 164.625. The refuge has a base station and 35 foot tower at its headquarters on route 16 north of Errol and a digital and analog repeater on top of the Town Hall in Upton, ME.

#### **f. Detection**

Most fires on the refuge will be discovered and reported by adjacent landowners, refuge visitors, or aircraft pilots. These may or may not be reported directly to the Refuge Manager; it is expected that often the individual will contact the local fire department or 911 directly and refuge staff may not find out about the fire until after it has already been attacked. Kiosks on the refuge will include emergency contact information. Environmental outreach efforts should include information on the preferred procedures for reporting wildfires. New Hampshire and Maine forest rangers patrol on a regular basis, stepping up this action during high fire danger periods. They also provide daily aerial detection, based on the need determined by fire danger class day. Under extreme fire danger, more than one detection flight is scheduled.

#### **g. Aviation**

Other than occasional detection flights conducted by the state, the use of aviation resources for fire suppression for the refuge is expected to be minimal. This is due not only to the relative lack of fire occurrence in this area, but also to the scarcity of aircraft resources which are certified to assist in fire suppression efforts. In the rare event that a fire develops which requires aircraft resources to suppress, two helicopter contractors, known to be carded by Office of Aircraft Services for multiple missions, are available in New Hampshire and northern New York (see Dispatch Plan). However, refuge staff should contact the contractors directly prior to the fire season to determine their most current status. White Mountain National Forest fire and aviation staff is also available to provide assistance to the refuge in locating qualified aviation contractors.

## **2. Initial Attack**

All wildland fires will be suppressed with fire fighter and public safety as the highest priority. Fires will be suppressed in a prompt, safe, aggressive, and cost-effective manner to minimize adverse impacts to resources and acreage. Generally direct attack is the most cost effective tactic, provided it can be done safely. Otherwise indirect tactics are necessary, as determined by the Incident Commander. In most cases, the local fire departments provide the primary initial attack response to wildfires as covered under the existing cooperative agreements (contact Refuge Headquarters for local and state cooperative agreements). Emergency contact numbers are listed in Attachment C. At this time none of the former logging roads are gated; however, many have limited accessibility because they have not been maintained and some are intersected by relatively deep erosion control ditches. Fire department personnel are authorized to use reasonable means for the purpose of emergency access.

### **a. Refuge Response and the Fire Warden System**

Upon notification of a fire, the Refuge Manager or designee will contact the appropriate fire department(s) to request initial attack suppression. The Refuge Manager will also inform the Zone FMO. Qualified and available refuge staff should respond, performing such tasks as securing the fire origin, assessing potential fire effects to resources, checking for visitors at risk, implementing public closure at the scene and noting vehicle traffic in the fire area. If the fire threatens to burn outside the refuge boundary, the Manager will notify adjacent landowners.

New Hampshire and Maine operate under a Forest Fire Warden system. The respective State Forester or Supervisor is responsible for designating Forest Fire Wardens, Deputy Wardens, and Special Deputy Wardens who work under authority of state laws to protect woodlands from fire. Wardens issue fire permits, enforce forest fire laws, maintain fire fighting tools and equipment, and investigate the cause of fires. Deputy Wardens may be located in communities to provide leadership to forest fire organizations in prevention, preparedness, and suppression. Special Deputies are experts in one or more specialized fire control functions and often are members of a local fire fighting team. ([www.nhdfl.org](http://www.nhdfl.org)).

The Refuge Manager and Incident Commander will ensure that the appropriate Town Fire Warden is informed of any initial attack actions taken, and will consult with the Warden prior to requesting resources beyond the first burning period.

### **b. Incident Commander**

The Division will use the Incident Command System (ICS) as a guide for suppression organization. When the town fire department arrives, the senior officer of that Department with jurisdiction, will serve as the Incident Commander (assumed delegation of authority) responsible for the fire. The Refuge Manager will brief the Incident Commander on the location and status of the fire, as well as provide pertinent details such as location and protection of special natural or cultural resources. The Incident Commander will:

- Locate, size-up, and coordinate suppression actions, including briefing subordinates, directing their actions and providing work tools.
- Provide public and firefighter safety.
- Considering current and predicted fire conditions assess the need for additional suppression resources and estimate the final size of the fire. The potential for spread outside of the refuge should be predicted, as well as the total suppression force required to initiate effective containment action.
- Assess the need for law enforcement personnel to serve in traffic control, investigations, evacuations, etc.,
- Keep Refuge Manager informed.
- Provide information to the Refuge Manager so that a fire report can be prepared and provided to the Zone FMO.
- Notify Refuge Manager when initial attack is not successful, so that planning for extended attack can begin and a Wildland Fire Situation Analysis can be developed for the next operational period.

Other duties of the Incident Commander are described in the National Wildfire Coordinating Group Fireline Handbook.

### **c. Public Safety**

Public safety will require coordination between refuge staff and the Incident Commander. Notices should be posted to warn visitors that areas may be closed and traffic control will be necessary if smoke crosses roads. Where wildland fires cross roads or foot trails, adjacent burned areas should be mopped up and dangerous snags felled. If needed, individuals not involved in suppression efforts may be evacuated.

## **3. Extended Attack**

For fires that cannot be contained in one burning period, a Delegation of Authority (Attachment F) to a new Incident Commander may occur and a Wildland Fire Situation Analysis (WFSA) must be prepared. The purpose of the WFSA is to consider fire suppression alternatives. Damages from fire, suppression costs, safety, and potential impacts of suppression actions are all important considerations. The Refuge Manager and Incident Commander, in consultation with the Zone FMO, will prepare the WFSA. Approval of the WFSA resides with the Refuge Manager.

Possible transition to extended attack is a critical decision in wildfire suppression that should involve full consultation of the Refuge Manager, Incident Commander, Zone FMO and cooperators. It has been found that firefighter fatalities or injuries, and excessive property loss or damage, occur during the transition phase from initial attack to extended attack. The progression from an initial attack, single burning period situation to an extended attack, multiple burning period incident is like peeling an onion and involves several “layers” of additional fire suppression assistance.

When initial attempts to control wildland fires become too difficult or risky, the responding town usually requests additional assistance. Fire departments calling for assistance contact mutual aid, and manpower and equipment are dispatched either directly to the fire scene or arrive at the town fire station for stand-by. Mutual aid fire assistance between towns has worked well for many years and is the primary source for additional assistance.

In the event that the Forest Fire Warden, in consultation with the Refuge Manager and Incident Commander, decides that specialized assistance is needed that is beyond the capability of the mutual aid group, the Warden may contact New Hampshire Division of Forest and Lands or the Maine Forest Service, depending on what state the fire is located in. The decision to provide state assistance will be made based on telephone conversations or a visit to the fire scene. Some of the state resources available during a wildland fire emergency include forest fire hand tools, specialized water handling equipment (e.g. portable pumps, forestry hoses), wildland fire investigation, specialized firefighting crews, and experience in fire behavior prediction and suppression strategies.

In the event of a large incident that could exceed the capability of local and state resources, the next step in the progression would be to request interagency assistance through the Northeast Dispatch Coordination Center (NECC). This could include such options as bringing in U.S. Forest Service resources from the White Mountain National Forest, other federal agencies, and assistance from other Northeast Forest Fire Compact (New England and New York states and Canada maritime provinces). Decisions of such magnitude should only be made with the full involvement of the Refuge Manager, Zone FMO, Town Fire Warden, State Forester, and U. S. Fish & Wildlife Service Regional Fire Management Coordinator.

#### **4. Air Quality**

Although the refuge is not within a Federal Class I Air shed under the Clean Air Act Amendments of 1977, visibility and clean air are valued natural resources and their protection will be given full consideration in fire management planning and operations. The refuge will comply with all applicable federal, state, and local air pollution control requirements, as specified within Section 118 of the Clean Air Act, as amended (42 USO 7418). Further guidance is found within the Service's Fire Management Handbook.

At issue with wildland fire is public and fire fighter safety and health. The refuge is to take aggressive action to manage smoke to prevent reduced visibility hazards, public safety, fire fighter exposure, and overall air quality (reduce particulate emissions). By minimizing the acreage burned, notifying the public, and restricting access these issues can be mitigated.

#### **5. Other Management Considerations**

##### **a. Step-Up Actions**

Larger stations commonly use a "step-up plan" to determine the appropriate level of readiness based on National Fire Danger Rating System (NFDRS) fire danger indices such as Burn Index (BI), Energy Release Component (ERC), or Keetch-Byram Drought Index (KBDI). Due to the low level of fire occurrence at the refuge, a lack of historic archived weather data upon which to calculate NFDRS breaking points, and considering that refuge staff are unlikely to become directly involved in initial attack actions, the preparation of a step-up plan appropriate to Lake Umbagog is not deemed essential at this time. However, Attachment B contains a generic example of a step-up plan and a preliminary calculation of NFDRS breaking points using an analysis of archived weather data obtained from other weather stations in northern New England. This can serve as a template and guide to future calculations should they become necessary due to changed circumstances.

##### **b. Regional and National Concerns**

The regional preparedness level follows the national preparedness level (1 – 5) unless the eastern seaboard is experiencing very dry conditions and a high potential for wildfire. Normal refuge operations usually occur through National Preparedness Level 4.

At National Preparedness Level 5, and when local fire conditions permit but subject to supervisory approval, all qualified individuals should be made available to meet regional and national needs.

### **c. Minimum Impact Suppression Guidelines**

Suppression efforts can sometimes cause more resource damage than the actual fire. Efforts to minimize resource damage must be a consideration with all suppression actions. As a general rule, the assigned Incident Commander will evaluate the suppression resource needs, seek alternatives to mechanized equipment in order to limit soil impacts, maintain natural water courses, and minimize land degradation, while at the same time minimizing the threat to human life and property. The Incident Commander shall seek Refuge Manager approval prior to any heavy equipment and retardant use on the refuge.

It is the responsibility of the Incident Commander to establish the minimum impact suppression tactics to protect natural and cultural resources. All personnel involved with fire management are expected to have an understanding of minimum impact suppression tactics such as indirect or parallel attack (instead of direct attack), utilization of existing barriers for control lines, and cold trailing. Further guidelines can be found in the Fire Management Handbook.

A Resource Advisor will be used on any fire that has the potential for significant resource damage caused by suppression operations or whenever the Incident Commander requests the position. The Resource Advisor should be an employee with resource management, and fire knowledge to advise the Incident Management Team on issues to mitigate adverse affects of suppression operations on cultural and natural resources.

### **d. Protection of Resources**

Natural and cultural resources will be protected to the maximum extent feasible, but their protection may not be the highest priority. Appropriate suppression action must first and foremost ensure firefighter and public safety. When no threat to human life exists, protection of natural and cultural resources from fire or suppression damage will be the next highest priority. For example, suppression tactics are chosen so that equipment and tools minimize adverse impacts. Critical protection areas such as private structures on abutting land, and administrative buildings will receive priority consideration during fire control efforts. Use of foam suppressants will be avoided to protect water quality. Use of heavy equipment such as dozers, tractors, skidders, or graders will be avoided unless their use is necessary to prevent a fire from destroying privately-owned and/or government buildings, cultural resources, or loss of human life. The use of heavy equipment requires approval from the Refuge Manager. If additional natural or cultural resources of concern are discovered during fire suppression activities, the Refuge Manager will ensure their protection as much as possible. The Manager will consult with the Regional Historic Preservation Officer to avoid, minimize, or mitigate potential or actual damage to cultural resources.

## **B. Wildland Fire Use**

As mentioned previously under section III.C., wildland fire use is not considered a viable management option at Lake Umbagog NWR.

## **C. Prescribed Fire**

Prescribed fire is not being considered as a habitat management tool under this first round of fire management planning for Lake Umbagog NWR. Currently a Habitat Management Plan (HMP) is being developed. It is possible that, in the future, prescribed fire will be determined an appropriate management tool to further certain HMP objectives. If that is the case, the Fire Management Plan will be revised at a later date to incorporate a Prescribed Fire section. Occasional burns may be warranted for disposal of woody debris other than vegetative material that cannot be transported to a landfill without undue expense or difficulty. For example, there may be debris from the demolition of camps or cabin sites. All debris burning would be conducted according to respective state regulations. In New Hampshire, only leaves, woody debris, or brush less than 5 “ in diameter or untreated wood and dimension lumber may be burned with a local permit. In Maine, debris burns may consist of painted and unpainted wood and demolition debris, wood wastes such as brush, stumps and lumber entirely free from metal, plastics, coatings, and chemical treatments. A local permit is also required in Maine. Attachment H outlines the procedure and checklist to be used for debris disposal burns.

## **D. Non-Fire Fuel Applications**

Access for emergency vehicles to ensure timely and effective response to wildfires will be an important consideration at the refuge. There is an existing network of former logging roads and skid trails within newly acquired land acquisitions, but these have not yet been inventoried. As road inventory information becomes available, refuge staff will make a concerted effort to:

- identify and prioritize roads critical for emergency vehicular access to protect values at risk
- determine the level of maintenance or improvement necessary for high priority roads
- attempt to secure funding for maintenance work
- issue scopes of work and solicit bids from prospective contractors to perform work
- provide oversight to contractors to ensure that work is completed in a quality and timely manner

Fuels funding is one of several potential sources that could be requested to maintain fire suppression access roads. When fuels funds are used, road work should be limited to vegetation removal along critical access roads to widen corridors, provide adequate turn-around space for engines and other equipment, and in some cases provide firebreaks or lines of defense for indirect attack. Fuel removal treatments should be calculated in acres and requested through the Zone FMO for inclusion in the National Fire Plan Operating and Reporting System (NFPORS). When the treatment is completed, a treatment report will be submitted to the Zone FMO.

## **E. Emergency Stabilization and Rehabilitation**

Post-fire repairs will fall into one of three categories: fire suppression activity damage, emergency stabilization, and rehabilitation (620 DM 3). Fire suppression activity damage is damage to resources, lands, and facilities resulting from wildland fire suppression actions, in contrast to damages resulting from the fire itself. Repair actions are planned and performed primarily by the suppression incident organization as soon as possible prior to demobilization. The incident management team, during transition back to the local unit, must document the fire suppression activity damage repair actions accomplished and those which are still needed. Fire suppression activity damage is paid by the same Wildland Fire Suppression Operations subactivity (9141) and project code as the fire suppression effort.

Emergency stabilization may be defined as planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources. Emergency stabilization actions must be taken within one year following containment of a wildland fire. Stabilization actions must be documented in an approved plan that describes in detail the actions proposed and costs, provision for monitoring results, delineation of funding, and responsibilities for implementation. Funding is provided under the Wildland Fire Suppression Operations account, but using a different subactivity (9142, Emergency Stabilization) than suppression. Plans are jointly reviewed by the Regional Fire Management Coordinator and the National Burned Area Emergency Rehabilitation Coordinator. Funding up to \$500,000 may be approved at the Regional Director level, while larger requests must be approved by the Fire Management Branch Chief. Examples of emergency stabilization actions that may be permitted include replacing or repairing minor facilities essential to public health and safety when no other options are available; placing structures to slow soil and water movement; stabilizing soils; increasing road drainage frequency and/or capacity to handle additional post-fire runoff; installing protective fences or barriers to protect treated or recovering areas; seeding to prevent invasive plant establishment, and direct treatment of invasive plants; using integrated pest management techniques to minimize non-native species establishment within the burned area; and monitoring of treatments and activities for up to three years.

Rehabilitation efforts are undertaken within three years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by the fire. These are long-term actions that have been already identified in approved land management plans. A rehabilitation plan will be written as a separate plan, independent of an emergency stabilization plan. Funding must be approved on a priority basis by the National Burned Area Emergency Rehab (BAER) Coordinators in consultation with the Office of Wildland Fire Coordination. Funds will fall under a burned area rehabilitation subactivity, not the Wildland Fire Operations account. Allowable actions may include chemical, manual, and mechanical removal of invasive species, and planting of native species to restore or establish a healthy, stable ecosystem; tree planting to reestablish burned habitat, reestablish native tree species lost in a fire, and prevent establishment of invasive plants; and repair or replace fire damage to minor operating facilities such as interpretive signs, exhibits, and fences. Funding for rehabilitation treatments falls under the 9262 subactivity.

## V. Organization and Budget

The organizational structure for meeting fire program needs within this Plan is based on a Service Zone concept. The Zone FMO (Service's New England Fire District) is the principal contact for technical support and assistance in fire management. In addition, there are five other fire-funded positions in Maine who could assist in plan implementation.

### A. Fire Management Team Responsibilities

**Refuge Manager (RM):** The Refuge Manager is responsible for the full range of management duties within the refuge including fire management activities that implement an effective fire management program. Appropriate action will be taken by the Refuge Manager for fires on or adjacent to the refuge. Related fire management activities include delegation of authority, designating resource advisors on incidents, implementing extended initial attack organizations, developing cooperative agreements and memoranda of understanding with local fire departments and state agencies, and authorizing the use of vehicles and heavy equipment within designated resource sensitive areas of the refuge.

**Regional Fire Management Coordinator (RFMC):** Provides coordination, training, evaluation, and technical guidance, as requested, to the refuge staff. Reviews and approves fire preparedness and fuels budget requests. The RFMC will be informed of all wildfire suppression activity occurring on the refuge through the Zone FMO.

**Fire Management Officer (FMO):** The FMO, stationed at Sunhaze Meadows National Wildlife Refuge, advises the Refuge Manager and staff on matters relative to fire planning, fire preparedness, suppression, and prescribed burning. The FMO supplies technical assistance and experience relative to fire management activities and also advises the RM on priorities, strategies, and tactics to reduce adverse fire impacts. The FMO coordinates fire training for refuge staff, enters fire reports into the computerized database, maintains staff qualifications through the IQCS system, and enters base information and requests into the FireBase workload analysis and budgeting system. The FMO makes recommendations to the RFMC on fire budget allocations to the refuge. The FMO may be called upon to gather additional resources necessary to implement this Plan.

### B. Budget

No fire funds are specifically earmarked to conduct fire management activities at the refuge. However, funds can be requested to meet hazard fuel treatment, prevention, or minor equipment and personal protective equipment needs through the Zone FMO on an annual basis. Other funds from regional fire program sources are available to cover training associated travel and physical exams. In addition, costs of emergency suppression to local cooperators are reimbursable from the national fire management emergency operations fund. Until additional needs for prescribed fire have been identified, cooperating fire departments close to the refuge serve to meet suppression needs and suppression objectives of this Plan.

Fire Program Analysis (FPA) is an interagency fire management workload analysis and budgeting system that will replace the existing FireBase system beginning in fiscal year 2006. All federal land ownerships within a given Fire Planning Unit (FPU) will be subject to a common optimization model that will determine optimum levels of resources by unit for a given funding level. Initial inputs to the system and running of the optimization model took place during the first half of fiscal year 2006. The refuge is part of Northeast Compact FPU 16 which includes all National Park Service, Forest Service, Bureau of Indian Affairs, and Fish & Wildlife Service land within New England and New York. It is unknown at this time what effect, if any, FPA will have on allocation of fire resources to Lake Umbagog NWR and other New England refuges.

### **C. Agreements**

A blanket agreement with the Maine Forest Service (contact Refuge Headquarters for this agreement) covers all rural departments within Maine. Agreements with New Hampshire State and local fire departments in New Hampshire need development or updating. The Service agrees to delegate Incident Commander authority to the departments in consultation with the local Forest Fire Warden. The Service agrees to reimburse the departments for suppression costs based on a rate schedule agreed to on an annual basis. These agreements will be effective for five years from date of signing.

## **VI. Monitoring and Evaluation**

### **A. Fire Investigation**

After a wildland fire has been detected, refuge personnel should be wary of suspicious individuals or vehicles. Personnel should not disturb a fire location in the event an investigation is needed. Personnel from responding fire departments will attempt to locate and protect the probable point of fire origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene, and report findings to the Incident Commander. All suspicious fires will be promptly and efficiently investigated. Individuals should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified.

Qualified personnel from other agencies may investigate wildland fire arson or fire incidents involving structures. All fire investigations should follow guidelines in the Service's Fire Management Handbook. The New England Fire Management Officer should be contacted as needed.

### **B. Required Reporting**

The Refuge Manager reports all wildland fires and hazard fuel treatments to the New England Fire Management Officer using the format provided in Attachment G. The FMO will then add the fire to the Fire Management Information System. The Incident Commander will be responsible for documenting decisions and completing a fire report (e.g., ICS-214, Agency Wildland Fire Report). Fire reviews will be documented and filed with the final fire report. The New England Fire Management Officer will retain a copy and will be responsible for additional required reports such as an annual regional fire summary and meeting national fire performance measures. This report will document fires by cause, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

## C. Annual Fire Management Plan Review

The Refuge Manager will review the Fire Management Plan annually and ensure necessary updates or changes are accomplished before the next fire season. Particular attention should be made to ensure that contact names and phone numbers listed in the Fire Dispatch Plan are current.

Upon completion of the Habitat Management Plan, the Fire Management Plan will be reviewed to determine if any goals, objectives, or strategies need to be revised in light of the decisions resulting from that planning process. The manager will determine if additions, deletions, or changes warrant re-approval of the plan.

## Glossary of Fire Terminology

**Anchor Point** - An advantageous location, generally a fire barrier, from which to start constructing a fireline; used to minimize the chance of being outflanked by the fire while the line is being constructed.

**Appropriate Management Response** - Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

**Backfire** - A predetermined strategy where a fire is set along the inner edge of a fireline to consume fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

**BEHAVE** - A system of interactive computer programs for modeling fuel and fire behavior, comprised of two subsystems; BURN and FUEL.

**Blackline** - Preburning of fuels adjacent to a control line, where there is no unburned material between the fireline and edge. A fireline reinforcement tactic.

**Burning Index** - An estimate of the potential difficulty of fire containment as it relates to the flame length at the head of the fire. In general, BI divided by a factor of 10 indicates approximate flame length, it traces seasonal trends reasonably well and is used by the agency for determining initial action resource needs (Step-Up Planning) based on fire potential only.

**Burning Period** - A 24-hour period ending at 10 a.m. The first burning period of a fire would be from the time of ignition until 10 a.m. the following day.

**Burning Out** - Setting fire inside a control line to consume fuel between the edge of the fire and the control line. Used to widen control lines during line construction or to eliminate unburned fuels inside the control lines after containment.

**Chain (ch)** - A unit of measure equal to 66 feet. 80 ch equals 1 mile; 10 ch<sup>2</sup> equals 1 acre. Commonly used to report fire perimeters and calculating fire size.

**Confine/Contain/Control** - These terms, when used in the context of suppression strategies, are confusing since they also have tactical meanings. Containment and control are assumed to maintain

their definition for fire reporting purposes, where “containment” implies the completion of a fireline around a fire and any associated spot fires which can reasonably be expected to stop the fire’s spread. “Control” is a point in time where fire suppression actions have removed any threat of fire escape, and at which time hazard pay stops.

**Energy Release Component (ERC)** - A NFDRS value related to the 24-hr potential worst case, total energy released per unit area within the flaming front at the head of a fire. It is directly related to the available energy (BTUs) per unit area (ft<sup>2</sup>) within the flaming front. The importance of this component is that the day-to-day variability is minimal as the value is not affected by wind speed. This is the best component for indicating the effects of intermediate to long-term drying on fire behavior.

**Firebreak (Fuel Break)** - A natural or constructed barrier used to stop or slow the spread of a fire, or, to provide a control line from which to work.

Fire Hazard - A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree and ease of ignition and/or resistance to control.

Fire line - The removal or alteration of fuel from a narrow area of a control line by the use of hand tools, power equipment, etc. to control a fire. It implies mineral soil exposure.

**Fire Management Plan (FMP)** - A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plan, preplanned dispatch plan, prescribed fire plans and prevention plans.

**Fire Management Unit** - Area within the refuge where there are common fire management goals, objectives, fuels, and resource uses have been defined. The size of the unit is not important, however an FMU should relate well to overall suppression and prescribed fire strategies defined within a Fire Management Plan.

**Fire Risk** - The chance of a fire starting, as affected by the nature and incidence of causative agents; an element of the fire danger in any area; any causative agent.

**Hazard Reduction** - The manipulation or removal of fuels to reduce the likelihood of ignition and lessen potential damage from wildfire. Normally hazard reduction is done to reduce the chance of major fire but can also be done to protect the resource or facility.

**Ignition Component (IC)** - A NFDRS value that rates the probability a fire brand will cause a fire requiring suppression action. Theoretically, on a day which registers an IC of 60, 60% of all firebrands which contact wildland fuels will start fires.

**Incident Command System (ICS)** - A combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure with responsibility for management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

**Indirect Attack** - Method of fire suppression in which the control line is located a considerable distance from the fire's active edge; generally used in the case of a fire with rapid rate of spread or high intensity to utilize natural or constructed fire breaks or fuel breaks and favorable breaks in topography. Intervening fuel is usually burned out, but occasionally the main fire is allowed to burn to the control, depending on conditions.

**Initial Attack** - An aggressive suppression action consistent with firefighter and public safety and values to be protected.

**Mixing Height** - Height a column of smoke will rise in the atmosphere.

**Mutual Aid** - Any form of free direct assistance from one fire agency to another during an emergency, based upon a prearrangement between agencies involved and generally made upon the request of the receiving agency.

**National Wildfire Coordinating Group (NWCG)** - A national interagency operational group authorized by the Secretaries of Agriculture and Interior designed to coordinate fire management programs of the participating agencies and providing a means of constructively working together. The group provides a platform to agree upon policy, standards of training, equipment, aircraft, suppression priorities, and other operational considerations.

**Normal Fire Year** - The year with the third greatest number of fires in the past ten.

**Normal Unit Strength** - The amount of non-capitalized fire fighting equipment needed by a refuge to meet 70 percent of suppression needs.

**Preparedness** - Activities that lead to a safe, efficient, and cost effective fire management program in support of land and resource management objectives through appropriate planning and coordination. Replaced the term "presuppression".

**Prescribed Fire** - Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition. The terms, "Prescribed Natural Fire and Management Ignited Prescribed Fire," are no longer valid.

**Prescription** - Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

**Resource Advisor** - Resource specialist responsible to the Refuge Manager for gathering and analyzing information concerning natural resources and their uses that may be impacted by the fire or fire suppression activities.

**Smoke Sensitive Area** - Area in which smoke from outside sources is intolerable, for reason such as heavy population, existing air pollution, intensive recreation or tourist use, including designated wilderness areas of a refuge.

**Spread Component (SC)** - An NFDRS rating term related to the potential 24-hr worst case forward rate of spread of a head fire. A value numerically equivalent to the predicted forward rate of spread of a head fire in feet/minute.

**Strategy** - Overall plan of attack for fighting a fire which gives regard to the most cost-efficient use of personnel and equipment in consideration of values threatened, fire behavior, legal constraints, and objectives established for management of natural resources. Actual decisions on tactical use of personnel and equipment are left to the assigned Incident Commander of an incident.

**Tactics** - Planned operational actions that determine specific fire suppression measures used to extinguish a fire. They must be consistent with the strategy established for suppressing the fire.

**Urban/Wildland Interface** - Area or zone where structures and other human developments meet or intermingle with underdeveloped wildland or vegetative fuels capable of sustaining wildfire.

**Wilderness** - An area established by the Federal Government and administered by various agencies in order to conserve its primeval character and influence for public enjoyment, under primitive conditions, in perpetuity.

**Wildfire** - An unwanted wildland fire.

**Wildland Fire** - Any non-structure fire, other than prescribed fire, that occurs in the wildland.

**Wildland Fire Management Program** - The full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation, and prescribed fire operations, including non-activity fires management to reduce risks to public safety and to restore and sustain ecosystem health.

**Wildland Fire Situation Analysis (WFSA)** - A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria. Replaces the term, "Escaped Fire Situation Analysis".

## REFERENCES

- Anderson, Hal E., 1982. Aids to Determining Fuel Models For Estimating Fire Behavior, USDA Forest Service GTR INT-122.
- Bailey, Robert G., 1995. Descriptions of the Ecoregions of the U.S.
- Bonnicksen, T.M., 2000. America's Ancient Forests. Texas A&M University, John Wiley & Sons. 594 pp.
- Bryce, Phil, 1997. Ecological Survey and Management Plan for Crown Vantage Lands within the Lake Umbagog National Wildlife Refuge. Crown Vantage Corporation and the Appalachian Mountain Club.
- Cogbill, Charles V., 2001. Natural Ecological Processes Affecting the Nulhegan Basin. Report prepared for the U.S. Fish & Wildlife Service.
- Cogbill, Charles V., 2000. Vegetation of the Presettlement Forests of New England and New York. Rhodora, Vol. 102, No. 911, pp. 250-276.
- Department of the Interior Departmental Manual, 1998. Part 620 Wildland Fire Management, Chapter 1 General Policy and Procedures.
- Frost, Cecil C., 1998. Presettlement Fire Frequency Regimes of the United States: A First Approximation. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, Florida.
- Gove, Bill, 2003. Log Drives on the Connecticut River. Bondcliff Books, Littleton, New Hampshire. 233 pp.
- Heinselman, Miron L., 1978. Fire Intensity and Frequency as Factors in the Distribution and Structure of Northern Ecosystems. USDA Forest Service, 1981 Proceedings of the Conference, Fire Regimes and Ecosystem Properties, GTR WO-26. 51 pp.
- Pike, R.E., 1967. Tall Trees, Tough Men. W.W. Norton & Company. 288 pp.
- Publicover, D. and Weihrauch, D. 2003. Appalachian Mountain Club, Boston MA 89pp.
- Pyne, Stephen, 1982. Fire in America: A Cultural History of Wildland and Rural Fire. University of Washington Press. 654 pp.
- Richburg, J.A., and W.A. Patterson III, 2000. The Fire Histories of Vermont and New Hampshire, with Particular Reference to the Green and White Mountain National Forests. Report submitted to the White Mountain National Forest, USDA Forest Service. Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA. 97 pp.

Rothermel, Richard C., 1983. How to Predict the Spread and Intensity of Forest and Range Fires. USDA Forest Service GTR INT-143.

Snyder, Michael. 1996. Burning Questions in Vermont's Forests. Vermont Woodlands, Spring 1996. pp. 30-34.

U.S. Fish and Wildlife Service. 1991. Lake Umbagog National Wildlife Refuge Final Action Plan and Environmental Impact Statement. Region 5, Newton Corner, MA.

U.S. Fish and Wildlife Service. 2000. Lake Umbagog National Wildlife Refuge Draft Public Hunting and Environmental Assessment.

U.S. Fish and Wildlife Service. 2004. Lake Umbagog National Wildlife Refuge Draft Habitat Management Plan.

U.S. Fish and Wildlife Service. 2004. Lake Umbagog National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment.

Wade, D.D., Brocks, B.L., Brose, P.H., Grace, J.B., Hoch, G.A., and Patterson, W.A., 20000. Wildland Fire in Ecosystems: Effects of Fire on Flora. (J. Brown and Jane Kapler Smith, eds.), GTR RMRS-42 vol. 2. Ogden, Utah.

Wallace, R. Stuart. 1989. New Hampshire History in Brief. New Hampshire Division of Historical Resources. Concord, NH.

## **ATTACHMENTS TO THE FIRE MANAGEMENT PLAN**

## **ATTACHMENT A**

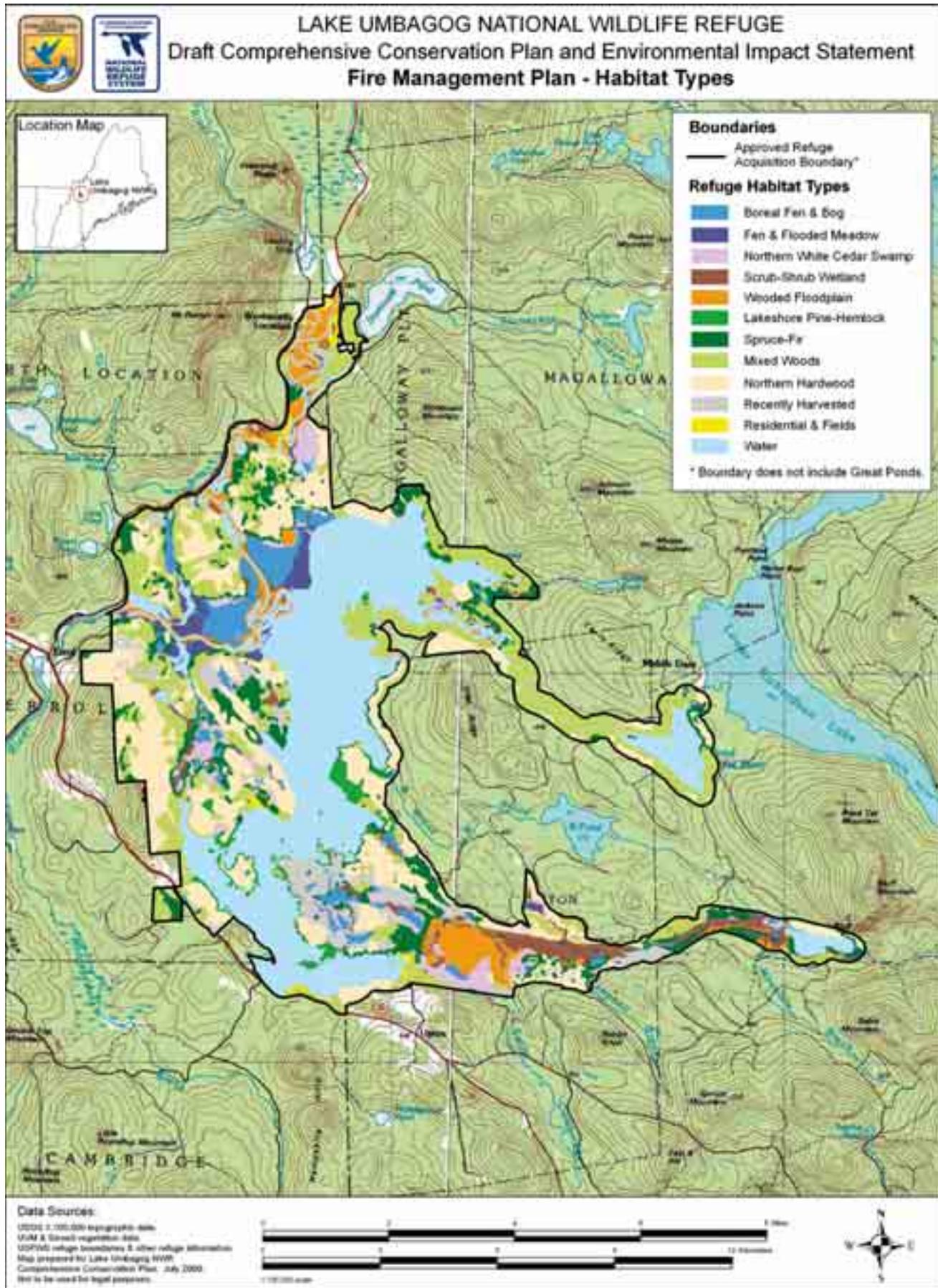
**Map I-1: Locality Map**

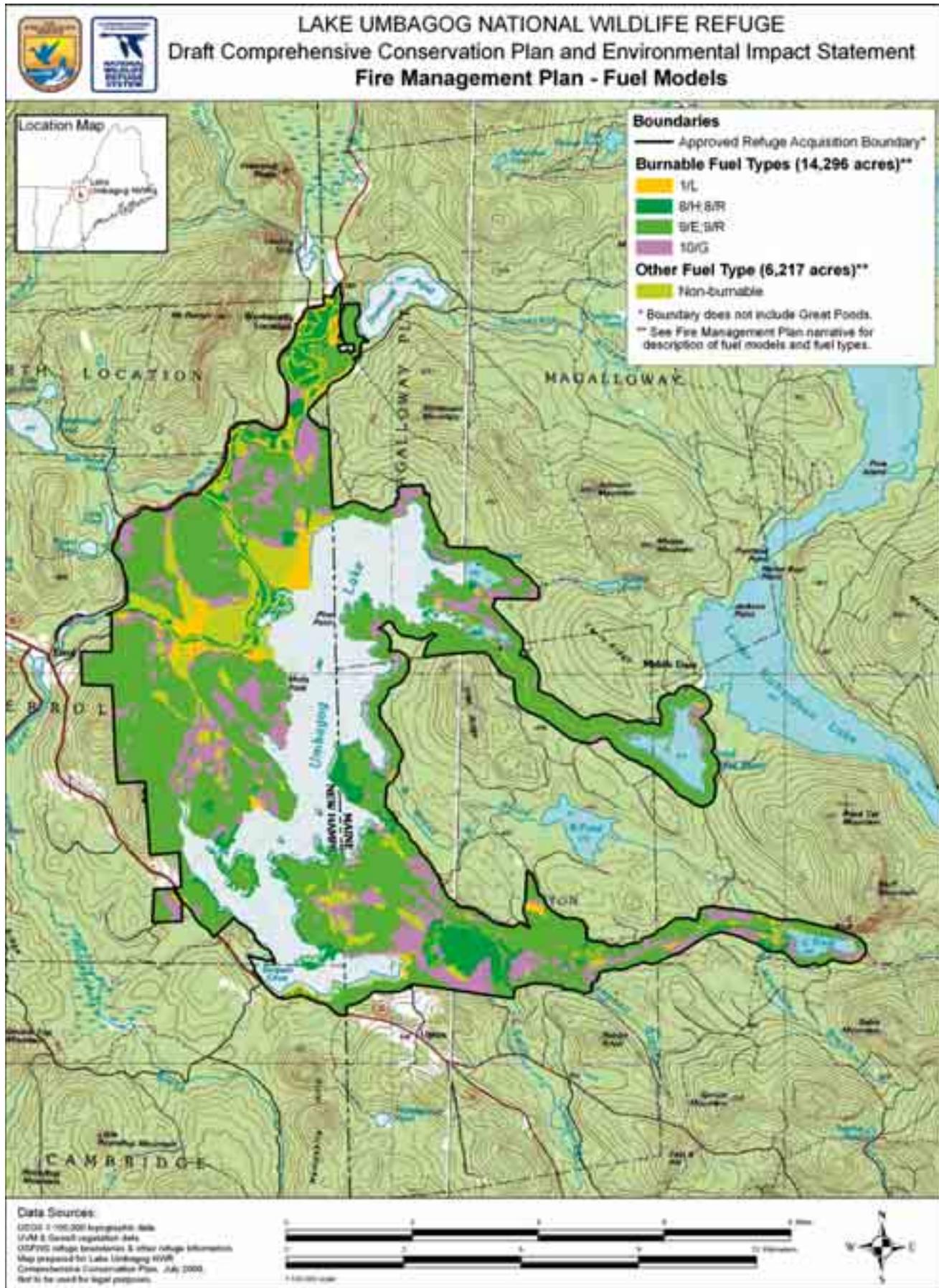
**Map I-2: Generalized Habitat Map**

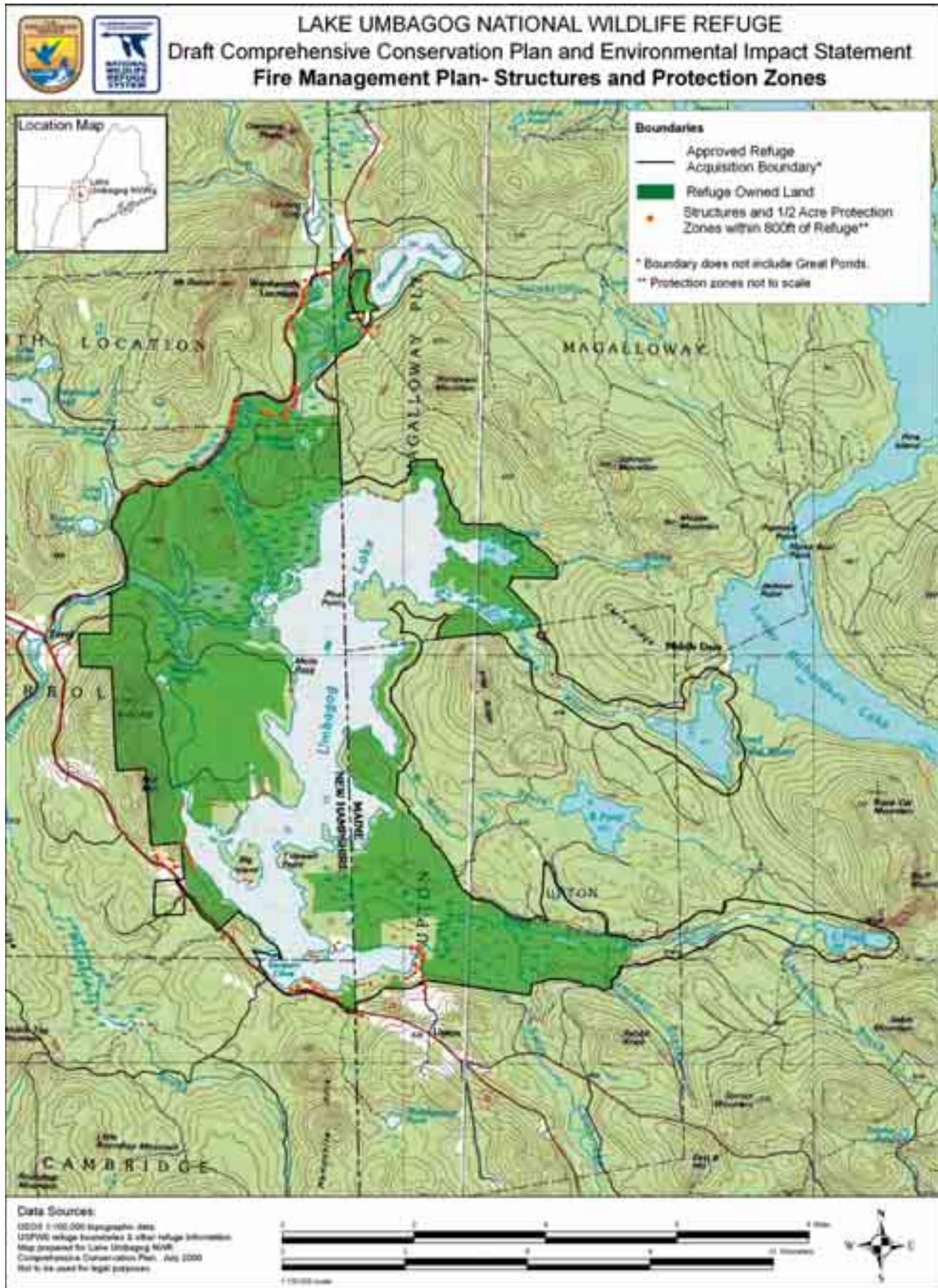
**Map I-3: Fuels Model Map**

**Map I-4: Infrastructure Map**









## ATTACHMENT B

### PRELIMINARY STEP-UP PLAN NATIONAL FIRE DANGER RATING SYSTEM ANALYSIS

#### Staffing Guideline

(Based on Fuel Model G Fire Family Plus outputs and a composite of northern New England fire weather observations from 1975-2003)

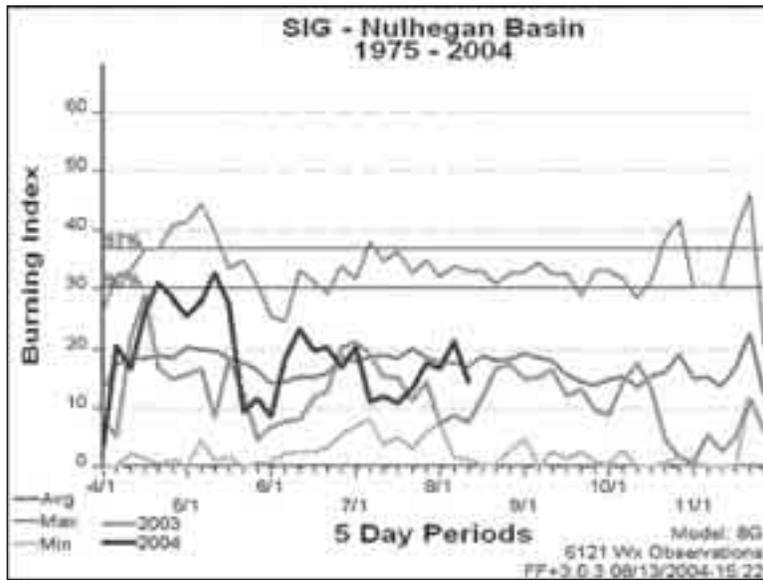
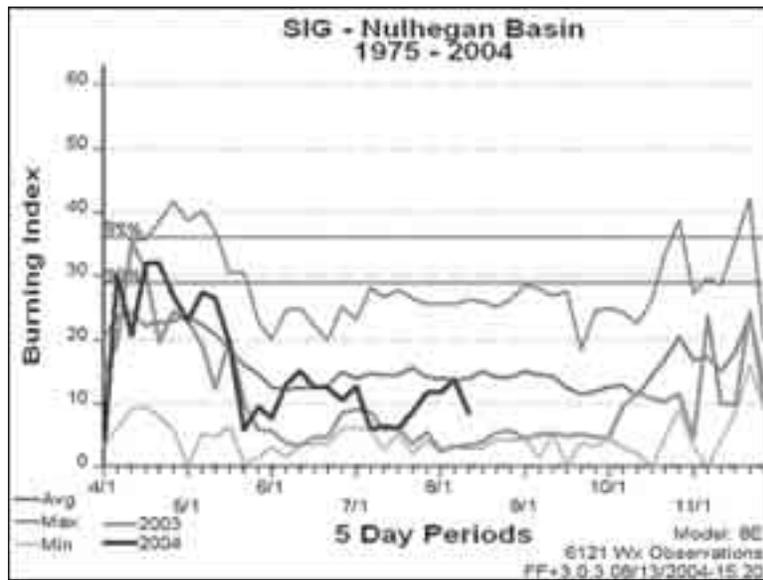
Staffing Class	Burn Index	Arson Starts	Adjective Class
I	0-10	0	Low
II	11-20	0-1 per month	Moderate
III	21-30	2-4 per month	High
IV	31-38	2-6 per week	Very High
V	39+	1+ per day	Extreme

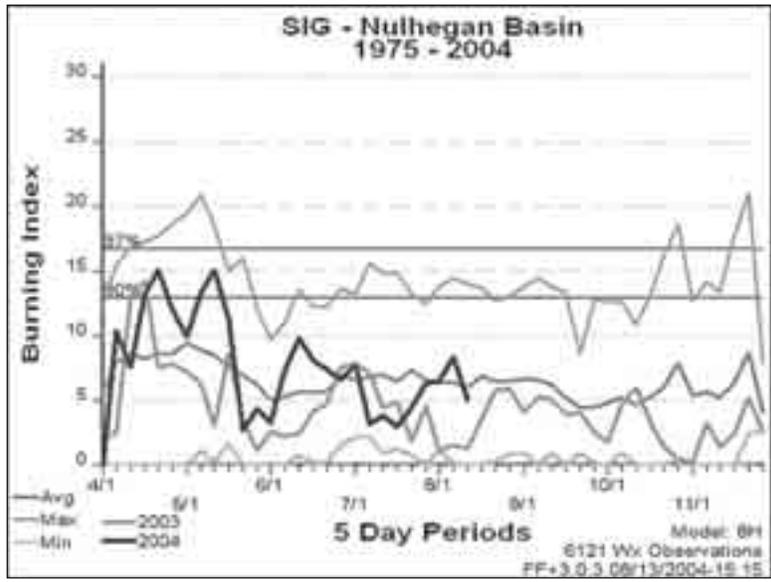
**Note:** Staffing Class may be triggered by either of the criteria of Burn Index or starts.

**ATTACHMENT B (contd)**

**Step-up Actions**

Staffing Class	Step-up Action
I	Normal tour of duty, normal operations, conduct fitness testing and training
II	Normal tour of duty, routine fire equipment maintenance
III	Normal tour of duty, ensure fire equipment and PPE readiness
IV	<p>Initiate emergency preparedness funding:</p> <ul style="list-style-type: none"> <li>● consider augmenting personnel (intermittent temporaries, AD, or detailers)</li> <li>● selected tour of duty changes to include evening and weekends</li> <li>● overtime for evening or weekend work where appropriate</li> <li>● consider L.E. patrols if arson is factor</li> <li>● fire personnel in pager or phone contact, PPE bags ready</li> <li>● fire equipment ready to roll</li> <li>● limit off-unit fire assignments</li> </ul>
V	<p>Emergency preparedness funding:</p> <ul style="list-style-type: none"> <li>● continue all Level IV actions</li> <li>● follow state closure restrictions, or consider closing refuge to public and woods operations</li> <li>● daily situation reports to RFMC (if fires are occurring)</li> <li>● consider requesting helicopter on standby for detection/suppression</li> <li>● conduct aerial detection flights if lightning occurs with little rainfall</li> </ul>





# ATTACHMENT C

## Lake Umbagog Fire Dispatch Plan

When smoke or fire is detected, take the following steps and maintain a log of all telephone communications.

1. Notify fire department, **911** or:
 

Errol Fire Department.....	603-482-3322 or 3334
Wilson Mills Fire Department (Lincoln Plt.).....	207-486-7791 or 7734
Magalloway Plantation.....	207-486-3446 or 3302
Upton Fire Department (Oxford County EMA).....	207-743-6336
  
2. Notify refuge personnel (see directory below)
  
3. Notify adjacent landowners if fire threatens to burn outside Division boundaries (see list below)
  
4. Notify Fire Management Officer:
 

Rick Vollick, Zone FMO-New England	<b>(W) 207-827-6138 x22</b>
	<b>(H) 207-827-3097</b>
	<b>(cell) 207-944-4967</b>

If not available, contact Regional Fire Management Coordinator or other Fire Management Officers from directory below

5. Remain on duty and provide information to fire department when they arrive
  
6. Notify State Police if smoke threatens visibility along area roads.
  
7. Post information regarding fire or closures, if necessary

### Directory of pertinent phone numbers:

#### Local Law Enforcement

Coos County Sheriff.....	603-837-9086
Oxford County Sheriff	
New Hampshire State Police.....	603-846-3333
Maine State Police	

Lake Umbagog NWR Staff- (O) 603-482-3415

Paul Casey, Project Leader..... (H) 207-533-2022  
Ian Drew, Assistant Manager.....(H) 207-824-8968

US. Fish and Wildlife Service Regional Office - Refuges

Janet Kennedy, Refuge Supervisor.....(W) 413-253-8553

Fish and Wildlife Service Region 5 Fire Personnel

Rick Vollick, Zone Fire Management Officer-New England.....(W) 207-827-6138 x22  
(H) 207-827-3097  
(cell) 207-944-4967

Allen Carter, Regional Fire Management Program Chief.....(W) 757-986-3409x101  
(H) 757-468-4769  
(cell) 757-647-1992

Michael Durfee, Fire Management Officer, NY, NJ, PA.....(W) 973-702-7266  
(H) 973-293-3423  
(cell) 973-632-4239

Joe Krish, Fire Management Officer, Blackwater NWR .....(W) 410-228-2692x128  
(H) 410-822-5046  
(cell) 443-521-3921

Tim Craig, Fire Management Officer, MD, DE, VA, WV.....(W) 757-986-3480  
(H) 757-934-8272  
(cell) 757-647-1596

Bill Giese, Fire Control Officer, Blackwater NWR..... (W) 410-228-2692x129  
(H) 410-228-0637  
(cell) 410-430-1782

Steve Hubner, Regional Wildland Urban Interface and Rural Fire Assistance Coordinator  
(W) 757-986-3409x104  
(H) 757-489-0830  
(cell) 757-647-1990

Bob Harris, Assistant WUI Coordinator, Rachel Carson NWR.....(W) 207-646-9099x32  
(cell) 207-251-2259

John Meister, Prescribed Fire Specialist.....(W) 207-827-6138x35  
(H) 207-827-3877  
(cell) 207-944-9167

Nancy Basta, Administrative Officer.....(W) 757-986-3409x102

Jan Taylor, Acting Chief, Wildlife and Habitat Management  
National Wildlife Refuge System.....(W) 413-253-8498

New Hampshire Department of Resources and Economic Development  
Division of Forests and Lands

Chief, Forest Protection Bureau, Concord .....(W)603-271-2217 x306

Albert von Dohrmann, Regional Forest Ranger, District 03, Lancaster.....(W)603-788-4157

John Accardi, Forest Ranger.....(W)603-788-4157 x 311

Steve Sherman, Forest Ranger .....(W)603-788-4157 x 312

Maine Forest Service

Kenny Wing, District Ranger, Rangeley.....(W)207-864-5545

Jay Bernard, Forest Ranger, Weld.....(W)207-585-2427

Tom Lillis, Forest Ranger, Cupsuptic.....(W)207-864-5545

National Weather Service

National Fire Weather Page: <http://fire.boi.noaa.gov/>

Gray, Maine National Weather Service Forecast Office..... 207-688-3221  
Fax: 207-688-3230

Fire Weather/Fire Danger: <http://www.erh.noaa.gov/er/gyx/html/firewxintro.htm>

Helicopter Contractors\*

Joe Brigham Helicopters, Inc.  
720 Clough Mill Road  
Pembroke, NH 03275  
(603) 225-3134

\*(check with OAS on current certification)

## ATTACHMENT D

### Minimum Impact Suppression Tactics

#### Safety

Safety is of utmost importance. Constantly review and apply the “Watch Out Situations” and “Fire Orders.” Be particularly cautious with:

- Unburned fuel between you and the fire.
- Burning snags allowed to burn.
- Burning or partially burned live and dead trees.

Be constantly aware of surroundings; anticipate fire behavior and possible fire perimeter 1 or 2 days hence.

#### Fire Line Phase

Select procedures, tools, equipment that least impact the environment.

Seriously consider using water as a fireline tactic. Fireline constructed with nozzle pressure, wetlining.

##### **In light fuels, consider:**

- Coldtrail line.
- Allowing fire to burn to a natural barrier.
- Burning out and use of “gunny” sack or swatter.
- Constantly rechecking coldtrailed fireline.
- If constructed fireline is necessary, using minimum width and depth to check fire spread.

##### **In medium/heavy fuels, consider:**

- Using natural barriers and coldtrailing.
- Cooling with dirt and water, and coldtrailing.
- If constructed fireline is necessary, using minimum width and depth to check fire spread.
- Minimizing bucking to establish fireline. Preferably move or roll downed material out of the intended constructed fireline area. If moving or rolling out is not possible, or the downed bole is already on fire, build line around and let material be consumed.

##### **In aerial fuels—brush, trees, snags:**

- Adjacent to fireline: limb only enough to prevent additional fire spread.
- Inside fireline: remove or limb only those that if ignited would have potential to spread fire outside the fireline.
- Brush or small trees that are necessary to cut during fireline construction will be cut flush with the ground.

**In trees, burned trees, and snags:**

- Minimize cutting of trees, burned trees and snags.
- Live trees will not be cut, unless determined they will cause fire spread across the fireline or endanger workers. If tree cutting occurs, cut the stumps flush with the ground.
- Scrape around tree bases near fireline if hot and likely to cause fire spread.
- Identify hazardous trees with an observer, flagging, and/or glow sticks.

**When using indirect attack:**

- Do not fall snags on the intended unburned side of the constructed fireline, unless they are safety hazard to crews.
- On the unintended burn-out side of the line, fall only those snags that would reach the fireline should they burn and fall over.
- Consider alternative means to falling, i.e., fireline explosives, bucket drops.
- Review items listed above (aerial fuels, brush, trees, and snags).

**Mop-up Phase**

Consider using “hot-spot” detection devices along perimeter (aerial or hand-held).

**Light fuels:**

- Coldtrail areas adjacent to unburned fuels.
- Do minimal spading; restrict spading to hot areas near fireline.
- Use extensive coldtrailing to detect hot areas.

**Medium and heavy fuels:**

- Coldtrail charred logs near fireline; do minimal scraping or tool scarring.
- Minimize bucking of logs to check for hot spots or extinguish the fire.
- Return logs to original position after checking or ground is cool.
- Refrain from making boneyards; burned/partially burned fuels that were moved should be arranged in natural position as much as possible.
- Consider allowing larger logs near the fireline to burnout instead of bucking into manageable lengths. Use lever, etc., to move large logs.

**Aerial fuels- brush, small trees, and limbs.**

- Remove or limb only those fuels that if ignited, have potential to spread outside the fireline.

## ATTACHMENT E

### Delegation of Authority

\_\_\_\_\_ is assigned as Incident Commander

on the \_\_\_\_\_ Fire and as such has full authority and responsibility for managing the fire suppression activities within the framework of law, agency policy, and direction provided in the Overhead Briefing and/or Wildland Fire Situation Analysis.

The Incident Commander's primary responsibility is to organize and direct assigned and ordered resources for efficient and effective suppression of the fire. The Incident Commander is accountable to the Refuge Manager or designated representative listed below. Financial limitations will be consistent with the best approach to the values at risk.

Specific direction for the \_\_\_\_\_ Fire covering management and environmental concerns are as follows:

- Use of heavy equipment, chemical retardants and foams will be limited to actions deemed essential to protect structures or provide for human safety. Use of these items outside these conditions will be allowed only after consultation and approval of the Refuge Manager.

\_\_\_\_\_ will represent me on any occasion that I am not immediately available.

This authority is effective as of \_\_\_\_\_.

\_\_\_\_\_  
Refuge Manager

\_\_\_\_\_  
Date/Time

# ATTACHMENT F

## WILDLAND FIRE REPORT

### GENERAL TAB

- (1) Fire Type: \_\_\_\_\_
- (2) Org. Code: \_\_\_\_\_
- (3) Fire Name: \_\_\_\_\_
- (4) Discovery Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_
- (5) County: Code: \_\_\_\_\_
- (6) Cong. District: \_\_\_\_\_
- (7) Fire Subtype: \_\_\_\_\_
- (8) Measurement Method: \_\_\_\_\_
- (9) Ignition Owner: \_\_\_\_\_
- (10) Ignition State: \_\_\_\_\_
- (11) Ignition Cause: \_\_\_\_\_
- (12) WFSA? Yes or No \_\_\_\_\_
- (13) If WFSA = yes, Date: \_\_\_\_\_

Burn  
Owner: \_\_\_\_\_

Burn  
Owner: \_\_\_\_\_

Burn State: \_\_\_\_\_ Burn Acres: \_\_\_\_\_

Burn State: \_\_\_\_\_ Burn Acres: \_\_\_\_\_

Burn State: \_\_\_\_\_ Burn Acres: \_\_\_\_\_

(14) Burn State: \_\_\_\_\_ (15) Owner: \_\_\_\_\_ (16) Burn Acres: \_\_\_\_\_

(17) Management Level: \_\_\_\_\_

(18) <u>Resource Type</u>	(19) <u>Quantity</u>	<u>Resource Type</u>	<u>Quantity</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

### Values at Risk

(20) <u>Type</u>	(21) <u>Subtype</u>
_____	_____
_____	_____
_____	_____
_____	_____

(22) Discovery Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (23) Time: \_\_\_\_ : \_\_\_\_ (24) Initial Attack Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (25) Time: \_\_\_\_ : \_\_\_\_

(26) Control Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (27) Time: \_\_\_\_ : \_\_\_\_ (28) Out Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ (29) Time: \_\_\_\_ : \_\_\_\_

**LOCATION TAB**

(30) Latitude: \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_ (31) Longitude: \_\_\_\_\_ . \_\_\_\_\_ . \_\_\_\_\_

(32) Aspect: \_\_\_\_\_ (33) Lay of Land: \_\_\_\_\_ (34) Slope: \_\_\_\_\_

(35) Position of Slope: \_\_\_\_\_ (36) Elevation: \_\_\_\_\_

(37) Special Area Type: \_\_\_\_\_

**EMISSIONS TAB**

(38) Fire Danger Index: \_\_\_\_\_ (39) Value: \_\_\_\_\_

**FINAL TAB**

(40) Person Completing Form: \_\_\_\_\_

(43) I.C.: \_\_\_\_\_ (41) Title: \_\_\_\_\_ (42) Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

(44) Narrative:

## ATTACHMENT G

### DEBRIS BURNING POLICY AND PROCEDURES

To provide some clarification and establish standard operating procedures for Region 5 field stations, the following protocol should be followed when considering the use of fire to dispose of debris. These guidelines comply with and elaborate on policy contained in Section 2.2.5 of the Service Fire Management Handbook.

(1) Determine if burning the debris pile is environmentally acceptable considering local, State, and Environmental Protection Agency regulations. Combustion of environmentally hazardous materials, such as certain types of treated lumber, is not an acceptable practice on Service lands, and could well be in violation of State or local air quality regulations. Even if the debris materials are “natural” vegetative waste with no chemical additives, the smoke produced by burning could be a public health and safety menace if persons with respiratory ailments are situated downwind, or if highway visibility is obscured. Whenever possible, debris material should be recycled into a useable material such as wood chips, mulch, firewood, etc. When recycling is not feasible, debris materials should be transported to a landfill or appropriate area where they can be safely disposed. Consistent with Service policies regarding solid waste (561 FW 5), stations are encouraged to reduce solid waste by promoting waste reduction, reusing and recycling materials, and proper disposal.

(2) If logistics or cost considerations make transportation and landfill disposal prohibitive, and there is no State or local air quality ordinance against burning, then fire may be considered as a disposal tool. All debris disposal burns must be reviewed for complexity by your Zone Fire Management Officer (FMO). This can often be handled by a single telephone call or electronic message, or the FMO may wish to see a written description or photograph of the project. In a few cases, the FMO may actually need to visit the burn site.

**Type A:** Type A debris disposal burns would be those where burn piles are completely surrounded by non-combustible barriers, such as a body of water, gravel parking lot, bare soil, or snow, and there is no chance the fire could spot into nearby combustible vegetation. The burn piles are relatively small, and fuels are consumed quickly. The Project Leader will need to complete the Debris Burning Checklist (attached below), which must be discussed with and approved by the Zone FMO. FMO approval may be by signature or verbal (telephone call). In these cases, the FMO may decide to treat this as a simple maintenance operation, and no burn plan would be required. No qualified Prescribed Burn Boss or prescribed burn crew members would need to be present, and the burn operation may proceed at the Project Leader’s discretion.

**Type B:** Type B burns would be slightly more complex, but still surrounded by non-combustible barriers with no chance of escape. Examples would be large debris piles that burn more intensely than Type A, or old wooden buildings, which need to be destroyed. These burns may be ideally suited as training exercises for local fire departments, who could perhaps

be persuaded to burn the debris for free. The Project Leader will need to complete the Debris Burning Checklist, which must be discussed with and approved by the Zone FMO. As in Type A, no burn plan is required, and a qualified Burn Boss and crew are not necessary. However, the FMO may wish to consult closely with the Project Leader or Fire Department Chief to ensure the operation is conducted safely.

Type C: Type C burns would be the most complex of the debris disposal burns, characterized by a greater chance of escape into adjacent combustible vegetation, smoke sensitive areas that could potentially be downwind, or large piles with high volumes of fuel producing high fire intensities. Type C burns will require that the FMO, or an individual of his choosing qualified as a Burn Boss at the appropriate complexity level, develop a Prescribed Burn Plan following the standard format in the Fire Management Handbook and that the plan be reviewed and approved by the appropriate Regional Office staff. The burn will be conducted by the Burn Boss and qualified prescribed burn crew, working in support of the Project Leader. The Burn Boss and crew will most likely be detailed in from another field station or group of refuges, and costs will be covered by the Regional Fire Management Office. Project Leaders and FMOs are encouraged to anticipate Type C burns a year or more in advance so that funding can be programmed.

## Debris Burning Checklist

What type of debris disposal burn is this?

\_\_\_\_\_ Type A

\_\_\_\_\_ Type B

\_\_\_\_\_ Type C

Have all other disposal alternatives been considered?

Justification:

Have State and local air quality requirements been met?

Has a burn permit been obtained through the local town or fire department, or appointed State fire warden? (Burning without a permit constitutes a violation of State fire laws subject to prosecution. Burning outside the restriction of the permit is also a violation.)

What is the reported fire danger or class day rating? (Burning permitted on low and moderate – Class Day 1 and 2 – only.)

List fire suppression equipment and number of people to carry out the debris burn.

What contingency steps are in place in the event of an escape?

States generally require complete extinguishment prior to abandoning a fire site. How will you meet this requirement?

Have you contacted your Zone Fire Management Officer and discussed this?

\_\_\_\_\_  
Zone FMO Approval

\_\_\_\_\_  
Project Leader Approval

